

The Developmental and Cultural Origins of Our Beliefs About Self-Control

Adrienne Wentel¹, Xin Zhao², Alison Gopnik¹, Carissa Kang², and Tamar Kushnir²

¹University of California, Berkeley; ²Cornell University

Forthcoming in In Mele, A. (Ed) *Surrounding Self Control*.

Abstract

Self-control is quite difficult- sometimes people are successful, but frequently they are not. So why do we believe that we can choose, by our own free will, to exercise self-control? In this chapter, we summarize recent research exploring the cultural and developmental origins of our beliefs about self-control and free will. We discuss how two factors contribute to the development of children's beliefs about self-control: culture and first-person experiences. Our studies of four-to eight-year-old children (N=441; Mean Age = 5.96 years; Range = 3.92 – 8.90 years) from China, Singapore, Peru and the U.S. indicate that self-control beliefs differ across cultures, and that, comparatively, U.S. children hold intuitions that they can freely choose to exercise self-control. Additionally, evidence indicates that the experience of self-control failure impacts beliefs about free will in U.S. children, but that these experience effects are not culturally universal.

Key words: Self-Control, Free Will, Development, Cross-Cultural, Choice, Inhibitory Control

The Developmental and Cultural Origins of Our Beliefs About Self-Control

Adults, particularly western adults, seem to believe that people can freely choose to exercise self-control. However, in reality, self-control is quite difficult- sometimes people are successful, but frequently they are not. So why do we believe that we can simply choose to exercise self-control? Is this belief grounded in our actual first-person experiences with self-control? Or is it of exogenous origins, perhaps culturally taught to us when we are young?

Our recent cross-cultural developmental research studies are beginning to answer these questions. In this chapter, we summarize findings on the development of intuitions about self-control, highlighting findings on the relationship between children's developing self-control abilities and their corresponding beliefs about self-control.

The Development of Intuitions About Choice

Infants and toddlers have basic intuitions about agent causation. They understand that desires vary from person to person, and that people's choices and actions frequently follow from their desires (Kushnir, Xu, & Wellman, 2010; Repacholi & Gopnik, 1997; Wellman, & Woolley, 1990). As adults, we have these same intuitions, however, our beliefs are more complex. We also believe that people can simply 'choose' to override their desires, and act in opposition to them. In this way, free will, or choice, is central to adults' theory of mind. It links desires to actions. When adults believe in free will in the strongest sense, they conceive of it as a variable that can be independently manipulated to cause a change in behavior. On this conception, we can simply

intervene on our own minds to change our behavior directly, without changing our beliefs or desires.

In our previous research, we have explored what children think about free will, and when they endorse choice in various types of situations. In one of the first studies, we asked children if a story character, Mary, could just choose to perform simple unconstrained actions if she wanted to, like stepping down off of a stool. These responses were contrasted with impossible actions, such as choosing to float in the air. By the age of 4, children reliably answered that Mary could choose to step down off of a stool, but could not choose to float in the air (Kushnir et al., 2015). It seems that by the age of 4, children believe that people can choose to perform simple unconstrained actions- like stepping off of a stool- but not physically impossible ones- like floating in the air.

In another set of experiments, Kushnir et al. (2015) asked children about epistemic, rather than physical, constraints on choices. Children were instructed to draw a picture, while the experimenter simultaneously drew another picture. Then children were asked if they could have just chosen to draw the same picture as the experimenter. In one condition, the experimenter's drawing was visible to the children, while in another condition the drawing was hidden from view. Here, 4-year-old children answered that they could have chosen to draw the same picture as the experimenter when they could see the picture, but not when their view was obstructed. Again, it seems that children understand basic epistemic constraints on choice- they believe people could have only done otherwise if they possessed the knowledge to do so.

While these studies suggest that children hold basic intuitions about choice and constraint by the age of 4, cases of self-control are more complex. If you are really craving a tasty dessert, and a bowl of ice cream is sitting right on the table in front of you, can you simply just choose to

not eat it? In real life, the answer to this question varies from case to case- sometimes people can, other times they cannot. Children likely receive probabilistic evidence about self-control in their day to day lives, and they themselves are quite bad at self-control. So, given this, what do children think about self-control? When do they start to believe that people can just choose to resist a tasty temptation?

In another set of experiments by Kushnir et al (2015), 4- and 6-year-old children were asked if they believed that people can choose to overcome their desires and practice self-control. In one condition children were asked about themselves (e.g. “Can you just choose to not eat a cookie?”), and in another condition children were asked about another person (e.g. “Can Sally just choose to not eat a cookie?”). In addition to questions about inhibition, children were also asked if they themselves or another person could choose to engage in undesirable actions (e.g. “Can Sally just choose to eat a bowl of yucky soup?”). Four-year-olds often stated that people had to act consistently with their desires; they believed that people could not just choose to practice self-control. Six-year-olds provided answers much more similar to adults, and endorsed the ability to practice self-control. Additionally, children tended to endorse self-control more when asked about another person than when asked about themselves, and also held an ‘action’ bias, where they believed that it was easier to do something they did not want to (eat the yucky soup) than refrain from doing something they wanted to do (not eat the ice cream).

<Insert Table 1>

One question that has emerged as a result of these findings, is whether children are actually endorsing a more metaphysically controversial notion of choice. When children say that

Sally can just choose to not eat the ice cream, do they really think that, holding all other factors constant, including beliefs and desires, Sally can still just *choose* to not eat the ice cream? Here the emphasis is on choice, because it implies that choice can be manipulated independently of preceding factors- like Sally's desires.

However, another possibility is that children are merely endorsing alternative possibilities when they answer that someone can choose to act inconsistently with their desires. If one or more crucial factor(s) changed (maybe Sally just ate a bowl of ice cream, so she no longer wants the one sitting in front of her) then Sally's desires might change, and as a result she would 'choose' to act differently. Here, the notion of choice implies a more stable link between desires and actions.

To gather more information about how young children perceive choice, children were also asked to explain why someone can choose to act inconsistently with their desires. If participants responded that Sally can choose to not eat the ice cream, they were asked, "Why can Sally just choose to not eat the ice cream?" Here children articulated a variety of reasons, however the majority of responses posited some sort of change or addition to the experimenter's story. Some of these responses focused on aspects external to the actor, for example, "The soup is healthy." Others suggested changes to the mental state of the actor, "She doesn't want it anymore." These sorts of responses suggest that the children believe that under certain internal or external conditions, people might act differently, rather than endorsing a strong sense of free will.

However, other children provided responses implying that choice, and self-control, is more autonomous. In response to the experimenter's question, one child said, "You can choose even if you don't want to." These sorts of responses suggest that by 4 and 6 years of age, some

children in the U.S.A hold incredibly strong intuitions about self-control; they believe that choice can override desires. Yet other responses suggest children believe that people can choose to act congruently with their desires, e.g. “You can choose to do whatever you want”. Overall, 14% of qualitative responses included one of these 2 more autonomous notions of choice. Further analyses should separate between these two types of responses. Fourteen percent may seem like a small percentage, however, in our ongoing research with adults, we found that U.S. adults gave these types of responses for about 30% of self-control questions.

These responses illustrate the classic paradox of free will. On one hand, it seems as if we can just autonomously choose to practice self-control, while on the other hand, we also believe that our actions are shaped by preceding factors, or, better yet, a collection of preceding factors- including desires, second order desires, social and normative constraints, physical motivations, and so on. Interestingly, in our experiments, many adults and children provided different types of responses throughout the experiment- for example they may appeal to a change in external factors when responding to one question, then describe choice more autonomously in response to another question. These results suggest variance across individuals, as well as within any one individual.

Cultural Influences on Free Will Beliefs

Perhaps intuitions about self-control are, at least in part, cultural taught. Indeed, several studies have found cultural variance in adults’ intuitions about choice (Kitayama, Snibbe, Markus, & Suzuki, 2004; Kokkoris, Kuhnén & Yan, 2013; Miller, Das & Chakravarthy, 2011; Savani, Markus, Naidu, Kumar & Berlia, 2010) and social causation more generally (Markus & Kitayama, 1991; Morris & Peng, 1994).

Central to the interpretation of these research findings, is the Markus and Kitayama (1991) distinction between independent and interdependent types of self-construal. According to this framework, people from more independently minded cultures, such as mainstream U.S. culture, view the self as separate from the surrounding context. Actions are perceived as internally caused and autonomously guided. People from more interdependently minded cultures, like China and Singapore, for example, view actions as more externally and socially caused.

Cultural differences in framework beliefs about social causation could influence the development of children's beliefs about choice. Choice is an internal process. Therefore, it is possible that children from more independently minded cultures might learn to emphasize choice to a greater extent than those from more interdependently minded cultures. Children from more independently minded cultures might also be more likely to perceive choice as causally autonomous, and independent from other influences.

To test these hypotheses, we extended our research to children from China. Chinese 4- and 6-year-old children were asked the previously described questions about self-control, and their responses were compared to those given by U.S. children. Results were consistent with our hypotheses, and indicated that Chinese children were less likely to endorse choice than U.S. children. This cultural trend held across the self and other domains, but was only seen for the inhibition question type. Comparable responses were given across cultures for the action question type. Chinese children also generated significantly fewer of the autonomous choice explanations than the U.S. children; autonomous choice responses were given after 14% of U.S. vs. 4% of Chinese children's "choose to" answers. In fact, the few 'autonomous choice' explanations that Chinese children did provide were relatively weak examples.

Notably, children's endorsement of choice did increase with age in both cultures. Even though Chinese children were less likely to endorse choice than U.S. children, Chinese 6-year-olds were still more likely to endorse choice than Chinese 4-year-olds. Children across cultures also endorsed choice less for cases of inhibition ("Can you just choose to not eat the cookie?") than for cases involving action ("Can you just choose to eat the yucky soup?"). Importantly, when they were asked about simple unconstrained actions, ("Can you just choose to walk from the kitchen to the living room?"), Chinese and U.S. children alike endorsed choice- suggesting that differences were not driven by linguistic differences in the way the questions were phrased. Conversely, children from both cultures, did not endorse choice when they were asked if people can do impossible things, like float in the air (Wente et al., 2015).

Chinese children endorsed choice less than U.S. children, however older Chinese children were still more likely to endorse choice than younger Chinese children. This suggests that children from both cultures are developing a belief that people can choose to practice self-control, however, this conceptual change is accelerated in U.S. children. The notion of autonomous choice was practically non-existent in Chinese children's explanations.

We have also asked Chinese and North American undergraduates these same questions. The results indicate developmental continuity. Adults, in both the U.S. and China, were more likely than children to endorse choice. Cultural differences for the inhibition questions were also maintained into early adulthood. Undergraduates tested in the U.S. endorsed more choice for these questions than undergraduates tested in China, with Chinese American undergraduates falling in between. There were also comparable cultural differences in the autonomous choice explanations, with, for example, 30 % of undergraduates at the University of California,

Berkeley providing these responses compared to 12% of undergraduates from Tsinghua University in Beijing, China.

These findings are similar to other cross-cultural research findings we have obtained. In another study, Chernyak, Kushnir, Sullivan, and Wang (2013) asked Nepalese and U.S. 4-to 11-year-olds if people can act against social and moral constraints. For example, children were asked questions like, “Can Jonny hit his friends?” or “Can Jonny wear a dress to school?” Here we found greater endorsements of choice from U.S. children than Nepalese children. Endorsement of choice was greater for older U.S. children than it was for younger U.S. children, whereas in Nepal no developmental trends were observed. Recent comparisons of Chinese and U.S. undergraduates on a subset of these social constraint questions again yielded similar cross-cultural trends; the Chinese undergraduates said they had less choice to act against social and moral constraints than the U.S. undergraduates.

More recently, we have also extended this research to children from Singapore and Lima, Peru. Similar cross-cultural trends were also found in comparisons between Singaporean children and U.S. children, who both speak English (Chernyak, Kang & Kushnir, 2019). U.S. children started to endorse the possibility of acting against social and moral constraints in middle childhood, while Singaporean children did not (or, depending on the social violation, did so to a lesser extent). The qualitative explanations children generated also mirrored cultural differences in Eastern vs. Western philosophies of self. Singaporean children gave more interdependent explanations (e.g. “It hurts his friend’s feelings”) than U.S. children. Singaporean children also referred more to punishment or permission from authority (e.g. “Mummy will scold him” or “She has to ask her mom”) when they explained the characters’ lack of choice, whereas the U.S. children did not.

More recently, we asked the questions about self-control to children in Lima, Peru. In our initial piloting of the self-control questions with 4- and 5-year-olds, we found that children only provided “choose to” responses for around 8% of questions. U.S. children of the same age provided “choose to” responses for over 50% of the questions (see Figure 2, Experiment 2). In Peru, we did not see any indication that children endorse choice for the self-control questions until the ages of 6 and 7, when children provide choose to responses for about 33% of questions (Wente, Kushnir, and Gopnik, 2017). Importantly, these same children do state that people can choose to preform simple unconstrained actions (e.g. choose to walk from the kitchen to the living room), again suggesting that cultural differences are not due to translation or general misinterpretation of the measures, but rather indicate that desires are particularly constraining for Peruvian children.

In sum, there is a growing body of evidence that the development of some types of beliefs about choice and free will are culturally influenced. Questions about people’s ability to freely practice self-control, and act against social and moral constraints, have yielded variance across cultures. Furthermore, the more philosophically controversial depiction of choice as causally autonomous is most frequently articulated by U.S. participants.

Even so, there are also several similarities between the different cultural groups tested thus far. Questions about unconstrained choices, and physically impossible actions are consistently answered similarly across all cultures. Importantly, the general developmental trend is also consistent across cultures; older children and adults in Peru, China and the U.S. are all more likely to endorse choice than younger children for the self-control questions.

How can we account for these similarities across cultures? What type of cross-culturally consistent information might shape children’s beliefs about self-control? One possible answer is

that children's beliefs about self-control stem from their actual experiences acting against desires. Certainly, children from around the world all experience practicing self-control, albeit to varying degrees and with varying levels of success.

Experiment 1

The Relationship Between Self-Control and Beliefs About Self Control

It is well known that young children are in the midst of developing their self-control abilities. In the classic delay of gratification marshmallow task, children are asked to refrain from eating a marshmallow for a period of time, in exchange for two marshmallows at a later point in time. Age consistently predicts success in delaying gratification (Mischel, 2004). Several other types of inhibitory control tasks have also yielded similar trends- that older children are better at inhibitory control than younger children (Carlson, 2010; Carlson & Moses, 2001; Oh & Lewis, 2008). Older children, across cultures, are also more likely to state that people can practice self-control than are younger children, as explained in the previous section. What is the relationship between children's experience with self-control and their corresponding beliefs about self-control? Might children who are better at self-control, as a result, hold stronger intuitions about self-control?

In our recent experiment, 4-to 8-year-old children ($N=54$, M Age = 6.21 years, $range = 3.97-8.90$ years) were asked four self-control and three social norm choice questions. See table 2 for more info. Here the questions were presented in the 3rd person. These same children were also asked to complete 4 types of inhibitory control tasks, including the toy sort task, the gift wrap task, the day/night stroop task, and the hearts and flowers task. Descriptions of the individual tasks, as well as the actual questions, are given below:

<Insert Table 2>

1. Toy sort: Taken from Denham, Warren-Khot, Bassett, Wyatt, and Perna (2012), children were shown 3 bins marked with 1 of 3 colored stickers. They were also shown a pile of appealing toys, marked with stickers identical to those on the bins. Children were instructed to put the toys in the bin with the matching sticker, and, most importantly, not to play with them. Children were scored on the number of toys they played with, as well as how long it took them to put away the toys.
2. Gift wrap: Developed by Kochanska, Murray, Jacques, Koenig, and Vandegest (1996), the experimenter told children that they had a surprise for them, however they needed to wrap it before giving it to them. Then they asked children to turn in their chair (at a 90 degree angle from the experimenter) and face the wall. Children were instructed to stay in their chair, and not to look or peek while the experimenter wrapped the surprise. The experimenter spent 1 minute 'wrapping' the surprise. Time until the first peek was recorded.
3. Day/night stroop task: Developed by Gerstadt, Hong, & Diamond (1994), children were shown a picture depicting night and instructed to say day when they saw it. Children were also shown a picture depicting day, but instructed to say night when they saw it. Then the experimenter tested children on 16 day and night pictures, 8 of each type. Children were scored on the percentage of correct responses they gave.
4. Hearts and Flowers: Developed by Davidson, Amso, Anderson, & Diamond (2006), children were instructed to press a button on one side of the computer when they saw a

heart stimulus presented on the computer screen. For hearts, the button was on the same side of the computer that the stimulus was presented on. They were instructed to also press a button when they saw a flower stimulus presented on the computer screen, however, for flowers, the button was on the opposite side of the computer the stimulus was presented on. Children completed 3 blocks- the first with just hearts, the second with just flowers, and the third was a combination of the two. Scores were taken from the second and third blocks only.

Children received 3 types of scores: One was an inhibitory control score that summed across the four types of inhibitory control tasks; one was the amount of “choose to” responses children provided for the four free will desire questions; and the final score was the amount of “choose to” responses children provided for the three free will social norm questions.

After controlling for age, we found positive correlation between U.S. children’s self-control beliefs, and their performance on the inhibitory control tasks; children who said that people can choose to act against their desires were more likely to do well on the inhibitory control tasks than those who stated that people cannot choose to act against their desires ($r = .43$, $p = .002$). No relationship was observed between the social norm and moral questions and the inhibitory control tasks (Zhao, Kang, Wente, Gopnik, Zhu, & Kushnir, 2017).

These findings indicate a relationship between U.S. children’s self-control abilities and their beliefs about self-control and raise questions about the nature of the relationship. One possibility is that children’s success at self-control leads to stronger intuitions about free will. Alternatively, children’s belief in the ability to choose their own course of action might motivate them to succeed at self-control tasks. In regards to this later possibility, research with adults (Job, Dweck, Walton, 2010; Savani & Job, 2017) and recent developmental research does suggest that

mindset predicts self-control (Haimovitz, Dweck, & Walton, 2015). And of course, a third variable could account for the correlation between the two types of measures, such as individual differences in both executive functioning and theory of mind (Carlson and Moses, 2001).

Experiment 2

The Causal Relationship Between Beliefs and Experience

To explore the causal relationship between self-control abilities and beliefs about self-control, we designed a second experiment where 4- and 5-year-old children ($N=149$ M age= 5.01 years, $range=$ 3.92- 6.02 years) completed the above toy sort and gift wrap tasks, and also answered the four desire free will questions. Children were asked about their own abilities. Children were also placed into one of two conditions: either they answered the free will questions first ($N=73$; M age= 5.03 years, and $range=$ 4.08- 5.97 years), or they completed the inhibitory control tasks first ($N= 76$; M age= 4.99 years, $range=$ 3.92- 6.02 years). This allowed us to test for any immediate causal transfer between the two tasks. Perhaps priming children to think about free will would alter their subsequent performance on the inhibitory control tasks, or alternatively, perhaps the immediate experience of success or failure at self-control would shape their subsequent beliefs about their own abilities.

Children were also asked to complete the standard Piagetian conservation task. They were shown 2 rows containing 5 pennies a piece. Then rows were expanded and contracted so that they were of unequal lengths. Children were asked to state which row had more pennies, or if they both had the same amount of pennies. Children answered 3 conservation questions. The purpose of the conservation task was to obtain a general measure of cognitive development. If

general cognitive development accounts for the correlation between beliefs and abilities, then no relationship should be observed after accounting for conservation score and age.

Again, we found a relationship between children's self-control abilities and their beliefs about self-control even after controlling for age and conservation score ($r(144) = -1.73, p = .036$). We also found that the experience that children had during the self-control portion of the task shaped their subsequent beliefs about their own abilities. Splitting the data by task order, and controlling for age and conservation scores, revealed a significant correlation for the children who completed the self-control tasks first ($r(72) = -.333, p = .004$). There was not a correlation for the children who answered the self-control questions first ($r(69) = -.05, p = .677$). Further exploration of the data revealed that it was those children who did *poorly* on self-control – children who both peeked at the gift during the gift wrap task and played with the toys during the toy sort task - who changed their subsequent beliefs about their abilities. That is, for the group of children who did poorly on both self-control tasks, the difference between answering belief questions before ($M = 2.35; SD = 1.63$) versus after ($M = 1.14; SD = 1.35$) the experience of failed self control was significant ($t(39) = 2.59, p = .014$). Interestingly, the opposite was not seen for kids who did well on both self-control tasks (belief questions before self control: $M = 2.25; SD = 1.84$, belief questions after self control: $M = 2.45; SD = 1.51; t(25) = -.304, p = .764$). Thus, we found that children's self-control beliefs were attenuated after experiencing failure, but not strengthened after experiencing success (Wente, Kushnir, & Gopnik 2017).

<Insert Figure 1>

These findings are both perplexing and illuminating. They indicate that failure at self-control weakens children's belief about free will, yet there is no evidence that success causes children to endorse free will. Why might there be this asymmetry? One explanation is that failure was a more salient experience for the children than success. Perhaps they approached the task assuming they would do well, and were surprised when they did not, resulting in a greater change to their beliefs. Another possibility is that this specific set of tasks just failed to strengthen children's beliefs. Overall the self-control tasks were quite difficult for children, and less than 20% of children passed both tasks. Exposing them to easier self-control tasks, where the success rate was higher, could strengthen their beliefs. Or, maybe the developmental increase seen in children's free will beliefs is not caused by successful self-control experiences. This is a question for future research.

Experiment 3

The Relationship Between Free Will Beliefs and Self-Control Across Cultures

In children from the U.S., we found both correlational and causal evidence supporting a link between children's beliefs and experience. This relationship, however, becomes more complex when considering children from other cultures. We know from our previous research that children from the other cultures we tested (China, Singapore, Nepal, and Peru) hold weaker beliefs about free will than U.S. children. Yet these children are not worse at self-control, in fact score higher in some studies than same-age peers in the U.S. (Lan, Legare, Cameron Ponitz and Morrison, 2011; Sabbagh, Xu, Carlson, Moses and Lee, 2006; Oh and Lewis, 2008). Multiple studies have reported that children from China and Korea, for example, score higher on inhibitory control than U.S. children. This cross-cultural pattern could be taken as additional

evidence that self-control experience does not cause children to believe that they can freely practice self-control. However, it is also possible that the experience of self-control itself is different across cultures, resulting in cultural differences in the relationship between beliefs and abilities.

One of the most canonical depictions of free will in western culture, is the picture of an agent with the devil on one shoulder, and an angel on the other, both whispering conflicting information. The agent, presumably using their free will, autonomously decides. However, this is not the only way that self-control may be achieved (if it is indeed achieved this way) or conceptualized. It is reasonable to think of self-control in a more deterministic sense- that people's actions directly follow from preceding influences, and the agent merely sums across the various influences.

It is possible that children from different cultures experience self-control in these different ways. Western children might feel that their self-control is caused by their own autonomous choices, rather than surrounding influences. Other children, particularly children from more interdependent cultures, might be more likely to view self-control as the direct result of other influences- such as social or environmental influences. The previously discussed analysis of Chinese, Singaporean, and U.S. children's qualitative explanations does support this possibility.

Recent experimental research comparing the behavior of Cameroonian Nso and German children during the marshmallow task suggests that children from different cultures may use different strategies to achieve self-control. In this study, German children exhibited more motor activity (e.g. turning away from the treat, or walking away) whereas Cameroonian Nso children displayed less motor activity, and some even fell asleep. These findings appear to indicate that

self-control strategies do differ in children from different backgrounds (Lamm, Keller, Teiser, Gudi, Yovsi, Freitag, et al. 2017).

If children do experience self-control differently across cultures, then it might follow that the relationship between experience and beliefs is also different across cultures. If children view their self-control as autonomously caused, then their experiences might more strongly influence their subsequent beliefs about choice and free will. If, on the other hand, children do not view their self-control as autonomously caused, then their experiences might have less of an impact on their subsequent responses to our free will questions.

To test this possibility, we extended Experiment 1 to Chinese ($N=72$; M age= 6.39 years; $range=4.39-8.80$ years) and Singaporean ($N=50$; M age= 6.01 years; $range=4.00-8.58$ years) children. Methods were identical across cultures. Children in China and Singapore were asked to complete the same 4 inhibitory control tasks, and answer the same 4 free will desire questions and the same 3 free will social norm questions. Again, questions were asked about a story character, and were not asked in the first-person format. The same 2 graduate students who tested the U.S. children, also tested the Asian children- one tested Chinese children and one Singaporean children. While Chinese children were tested in Mandarin, Singaporean children were tested in English using an identical protocol to the one used in the U.S. Results were consistent with our hypothesis. We replicated age trends found in the U.S. for both self-control beliefs as measured by the free will desire questions and self-control abilities as measured by the inhibitory control tasks. But, controlling for age, we found no significant relationships between children's beliefs and abilities in either Singaporean ($r = -.17, p = .29$) or Chinese ($r = -.05, p = .68$) children.

<Insert Figure 2>

We have more recently extended Experiment 2 to children in Lima, Peru (self-control tasks first: $N=50$, M age= 7.11 years, $range=$ 6.03- 7.99; free-will questions first: $N=50$ M age= 7.02 years, $range=$ 6.03- 7.99 years). Similar to Experiment 1, there was no relationship between Peruvian children's self-control score, and their free will score, either overall ($r(95)= -.128$, $p=.21$) or by task order (free will questions first, $r(45)= -.166$, $p=.265$, self-control tasks first, $r(46)= -.093$, $p=.529$). Taken together, it appears that culture mediates the relationship between the development of children's beliefs about self-control and their actual self-control abilities.

What are the Origins of Our Beliefs About Self-Control?

Our findings suggest that beliefs about self-control are influenced by culturally transmitted notions of agency. They also suggest that first person experiences with self-control impact beliefs about self-control, however this relationship is mediated by culture. In two studies, using slightly different methodology, we found correlations for U.S. children but not for children in China, Singapore and Peru. While these findings are informative, they also bring to light additional questions that should be explored in follow-up research.

First, as previously discussed, does experience with self-control actually cause U.S. children to believe that they can freely choose to practice self-control? While we have evidence of a causal relationship between experience and beliefs, we do not yet have evidence that experience gives children this belief, or even strengthens their belief in free will. It is possible that this belief initially comes from exogenous sources, and is later fine-tuned through first-person experience.

Another related question is how to account for the cultural differences in children's beliefs about self-control. One possibility is that culturally transmitted notions of agency shape children's experiences with self-control, and this in turn influences the relationship between experience and beliefs. Another possibility is that children across cultures are explicitly taught different things about self-control, and this directly shapes the way they respond to our questions. Of course, it is possible that culture influences children's responses in multiple ways. Regardless, these studies show that both first-person experiences with self-control, and culturally transmitted notions of agency, shape intuitions about self-control.

Acknowledgements

This chapter was made possible through the support of a grant from the John Templeton Foundation.

The opinions expressed in this chapter are our own and do not necessarily reflect the views of the John Templeton Foundation. We also wish to thank Sherry Chen, Titus Ting, Teresa Garcia, Denise Segovia, and María Fernández Flecha for assistance with research activities.

References

- Carlson, S. (2010). Developmentally sensitive measures of executive functioning in preschool children. *Developmental Neuropsychology*, 28, 595-616.
- Carlson, S. & Moses, L. (2001). Individual differences in inhibitory control and children's theory of mind. *Child Development*, 4, 1032-1053.
- Chernyak, N., Kushnir, T., Sullivan, K., & Wang, Q. (2013). A comparison of American and Nepalese children's concepts of freedom of choice and social constraint. *Cognitive Science*, 37, 1343-1355. doi: 10.1111/cogs.12046.
- Chernyak, N., Kang, C., & Kushnir, T. (2019). Cultural and developmental differences between U.S. and Singaporean children's explanations for freedom of choice. *Developmental Psychology*, doi: 10.1037/dev0000670
- Davidson, M. C., Amso, D., Anderson, L. C., & Diamond, A. (2006). Development of cognitive control and executive functions from 4 to 13 years: Evidence from manipulations of memory, inhibition, and task switching. *Neuropsychologia*, 44(11), 2037-2078.
- Denham, S. A., Warren-Khot, H. K., Bassett, H. H., Wyatt, T., & Perna, A. (2012). Factor structure of self-regulation in preschoolers: Testing models of a field-based assessment for predicting early school readiness. *Journal of Experimental Child Psychology*, 111(3), 386-404.
- Gerstadt, C. L., Hong, Y. J., & Diamond, A. (1994). The relationship between cognition and action: Performance of children 3.5-7 years old on a Stroop-like day-night test. *Cognition*, 53, 129- 153.
- Haimovitz, K., Dweck, C. S., & Walton, G. M. (2015). Implicit theories of willpower and children's delay of gratification. Talk presented at the biennial meeting for the Society for Research on Child Development, Philadelphia, PA.

- Job, V., Dweck, C., Walton, G.M. (2010). Ego depletion-- is it all in your head? Implicit theories about will power affect self-regulation. *Psychological Science*, 11, 1686-1693. doi: 10.1177/0956797610384745
- Kang, C., Chenryak, N., & Kushnir, T. (under review). Cultural and developmental differences between U.S. and Singaporean children's explanations for freedom of choice.
- Kitayama, S. Snibbe, A.C., Markus, H. R., & Suzuki, T. (2004). Is there any "free" choice?: Self and Dissonance in two cultures. *Psychological Science*, 15, 527-533. doi: 10.1111/j.0956-7976.2004.00714.
- Kochanska, G., Murray, K., Jacques, T. Y., Koenig, A. L., & Vandegest, K. A. (1996). Inhibitory control in young children and its role in emerging internalization. *Child Development*, 67(2), 490-507.
- Kokkoris, M. D., Kuhnen, U. & Yan, S. (2013). Likes, dislikes, and the perception of choice and self-expression across cultures. *Journal of Cognition and Culture*, 13, 129-143. doi: 10.1163/15685373-12342088.
- Kushnir, T., Gopnik, A. Chernyak, N., Seiver, E., A., & Wellman, H. M. (2015). Developing intuitions about free will between ages four and six. *Cognition*, 138, 79-101. doi: 10.1016/j.cognition.2015.01.003.
- Kushnir, T., Xu, F., & Wellman, H. M. (2010). Young children use statistical sampling to infer the preferences of other people. *Psychological Science*, 21, 1134-1140. doi: 10.1177/0956797610376652.
- Lamm, B., Keller, H., Teiser, J., Gudi, H., Yovsi, R. D., Freitag, C., ... & Vöhringer, I. (2017). Waiting for the Second Treat: Developing Culture-Specific Modes of Self-Regulation. *Child Development*. doi: 10.1111/cdev.12847

- Lan, X., Legare, C.H., Cameron Ponitz, C., Li, S., Morrison, F. J. (2011). Investigating the links between the subcomponents of executive functioning and academic achievement: A cross-cultural analysis of Chinese and American preschoolers. *Journal of Experimental Child Psychology, 108*, 677-692. doi: 10.1016/j.jecp.2010.11.001.
- Markus, H. R., & Kitayama, S. (1991). Culture and the self: Implications for cognition, emotion, and motivation. *Psychological Review, 98*, 223-253. doi:10.1037/003 295X.98.2.224.
- Miller, J.G., Das, R., & Chakravarthy, S. (2011). Culture and the role of choice and agency. *Journal of Personality and Social Psychology, 101*, 46- 61. doi: 10.1037/a0023330.
- Mischel, W. (2014). *The Marshmallow Test: Mastering Self-Control*. Little Brown and Company, New York, New York.
- Morris, M.W., & Peng, K. (1994). Culture and cause: American and Chinese attributions for social and physical events. *Journal of Personality and Social Psychology, 67*, 949-971. doi:10.1037/0022-3514.67.6.949.
- Oh, S., & Lewis, C. (2008). Korean preschoolers' advanced inhibitory control and its relation to other executive skills and mental state understanding. *Child Development, 79*, 80-99.
- Repacholi, B. M. and Gopnik, A. (1997). Early reasoning about desires: Evidence from 14- and 18-month olds. *Developmental Psychology, 33*, 12-21. doi: 10.1037/0012-1649.33.1.12.
- Sabbagh, M. A., Xu, F., Carlson, S. M., Moses, L. J., & Lee, K. (2006). The development of executive functioning and theory of mind: A comparison of Chinese and U.S. preschoolers. *Psychological Science, 17*, 74-81. doi: 10.1111/j.1467-9280.2005.01667.x.

- Savani, K. & Job, V. (2017). Reverse ego-depletion: Acts of self-control can improve subsequent performance in Indian cultural context. *Journal of Personality and Social Psychology*, 113(4), 589-607. doi: 10.1037/pspi0000099
- Savani, K., Markus, H. R., Naidu, N. V. R., Kumar S., & Berlia, N. (2010). What counts as choice?: U.S. Americans are more likely than Indians to construe actions as choices. *Psychological Science*, 21, 391-398. doi: 10.1177/0956797609359908.
- Wellman, H. M., & Woolley, J. D. (1990). From simple desires to ordinary beliefs: The early development of everyday psychology. *Cognition*, 35, 245-275. doi: 10.1016/00100277(90)90024-E.
- Wente, A., Bridgers, S., Zhao, X., Seiver, E., Zhu, L., & Gopnik, A. (In press). How universal are free will beliefs? Cultural differences in Chinese and U.S. 4- and 6- year-olds. *Child Development*.
- Wente, A., Kushnir, T., and Gopnik, A. (2017). The relationship between self-control abilities and children's beliefs about self-control. Present at the Cognitive Development Society Bi-Ennial Conference, Portland, OR.
- Zhao, X., Kang, C., Wente, A., Gopnik, A., Zhu, L., & Kushnir, T. (2017). Present at the Society for Philosophy and Psychology 43rd Annual Meeting, Baltimore.

Table 1: Definitions and Examples of Question Types

Question Type	Definition	Example Questions
Simple Choice	Asks if an actor can choose to engage in unconstrained actions	Can Sally just choose to step down from the stool, or does she have to stay standing on the stool?
Physically Impossible	Asks if an actor can choose to perform physically impossible actions	Can Sally just choose to float in the air, or does she have to come down?
Desire Inhibition	Asks if an actor can choose to inhibit themselves from a desired action	Can Sally just choose to not eat a [desirable] cookie, or does she have to eat the cookie?
Desire Action	Asks if an actor can choose to engage in an undesirable action.	Can sally just choose to eat the [undesirable] soup, or does she have to not eat it?
Social/ Moral/ Normative	Asks if an actor can act against a social, moral or normative constraint.	Can Sally just choose to hit her friends, or does she have to not hit them?

Table 1: Definitions and examples of question types used in previous studies.

Table 2: Questions Asked During Experiments 1 and 3

Question Type	Questions Asked
Self-Control (Desire)	Let's imagine there is a box on the table. Sally sees the box and she does not know what is inside. Sally is curious about the box. She thinks there might be something good in the box. Even though she is curious, can Sally just choose not to look into the box, or does she have to look in it?
	Let's imagine there is a closet here. Susan sees the closet and she does not know what is inside. Susan is scared of the closet. She thinks there might be something scary in the closet. Even though she is scared of it, can Susan just choose to look into the closet, or does she have to not look in it?
	Let's imagine that there is a cracker on the table in front of us. Rosie sees the cracker and she doesn't like it. Rosie thinks the cracker tastes yucky. Even though she does not like it, can Rosie just choose to eat the cracker, or does she have to not eat it?
	Let's imagine that there is a piece of cereal on the table. Sophie sees the cereal and she likes it. Sophie thinks the cereal tastes good. Even though she likes it, can Sophie just choose not to eat the cereal, or does she have to eat it?
Social/ Norm	Johnny sees his friends every day. He always plays with his friends nicely. But today, Johnny wants to do something different. Johnny wants to hit his friends. Is it ok for Johnny to hit his friends? Why/why not? Ok, even though it's [not nice] can Johnny just choose to hit his friends today anyway?

Rory's mom gives Rory some candies to share between her brother and herself. Rory **always** gives half the candy to her brother, and takes half of them for herself. But today, Rory wants to do something different. Rory **wants** to take all of the candies for herself. Is it ok for Rory to take all of the candies for herself? Why/why not? Ok, even though it's [not fair] can Rory **just choose to** take all of the candies for herself anyway?

Polly's parents tell her not to lift her little sister because she's too heavy for Polly and Polly might get hurt. Polly **always** listens to her parents and doesn't lift her little sister. But today, Polly wants to do something different. Polly wants to lift her little sister. Is it ok for Polly to lift her little sister? Why/Why not? Ok. Even though it's [not safe] can Polly **just choose** to lift her little sister anyway?

Simple Control

Peter draws a picture every day. He **always** uses a pen to draw his picture. But today, he wants to do something different. Peter **wants** to draw his picture with a marker. Even though he usually uses a pen, can Peter **just choose to** draw his picture with a marker anyway?

Impossible Control

Bobby walks to the store every day. He **always** walks around the big brick wall. But today, he wants to do something different. Bobby **wants** to walk right through the big brick wall. Even though the wall is made of bricks, can Bobby **just choose to** walk right through the wall?

Table 2: Questions asked during experiments 1 and 3.

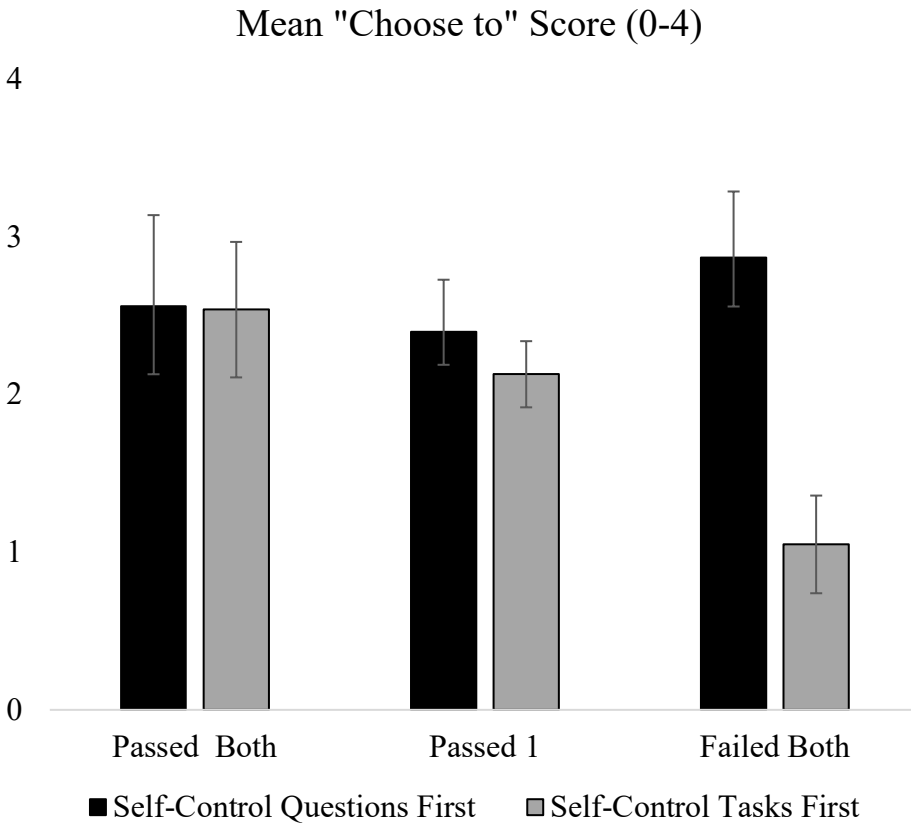


Figure 1: Four- and 5-year-old children’s mean “choose to” responses for the self-control questions. Data is split by self-control task performance (succeeded at both, 1 or neither tasks) and condition (self-control questions first vs. self-control tasks first). Higher scores indicate a greater endorsement of choice. Error bars indicate one standard error of the mean in either direction.

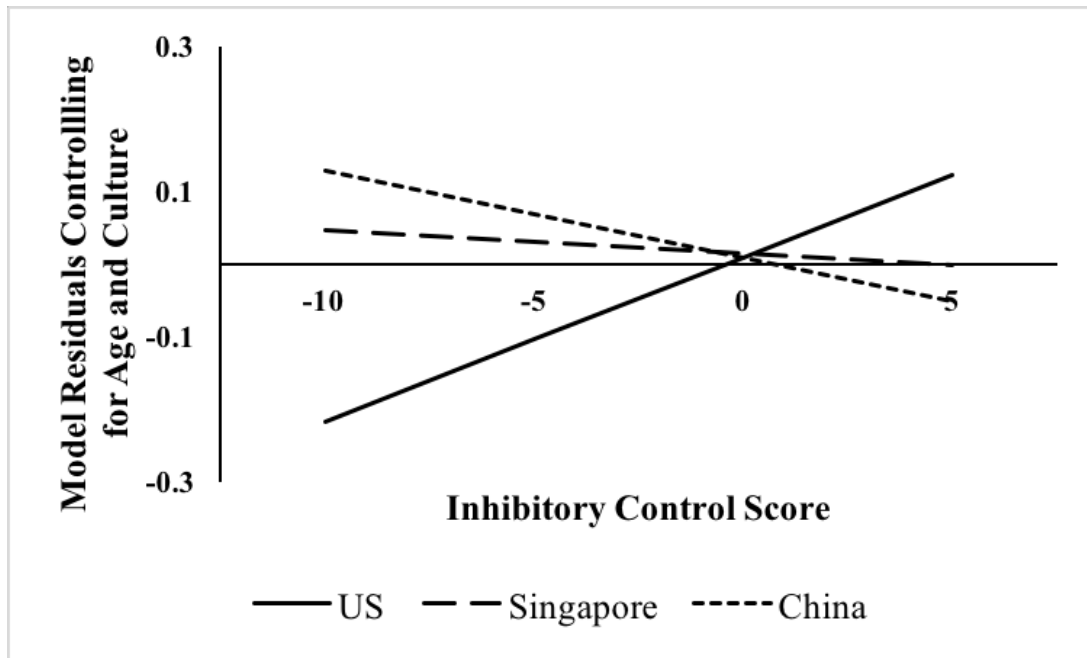


Figure 2: Relationship between beliefs about self-control and inhibitory control performance in each culture after controlling for age and cultural differences in inhibitory control. Significant positive correlation between self-control beliefs and inhibitory control was found for U.S. children, but not for Singaporean children or Chinese children.